Arizona Department of Transportation

Engineering Survey Section (ESS)

Unmanned Aerial Vehicle (UAV) Support

How did we begin?

- ESS began transitioning from traditional photogrammetry - April 2017
- 2 operators FAA Part 107 certified - April 2017
- Trimble ZX-5 sUAS acquired - May 2017
- Training completed & began flying - June 2017
- 1st project flown August 2017

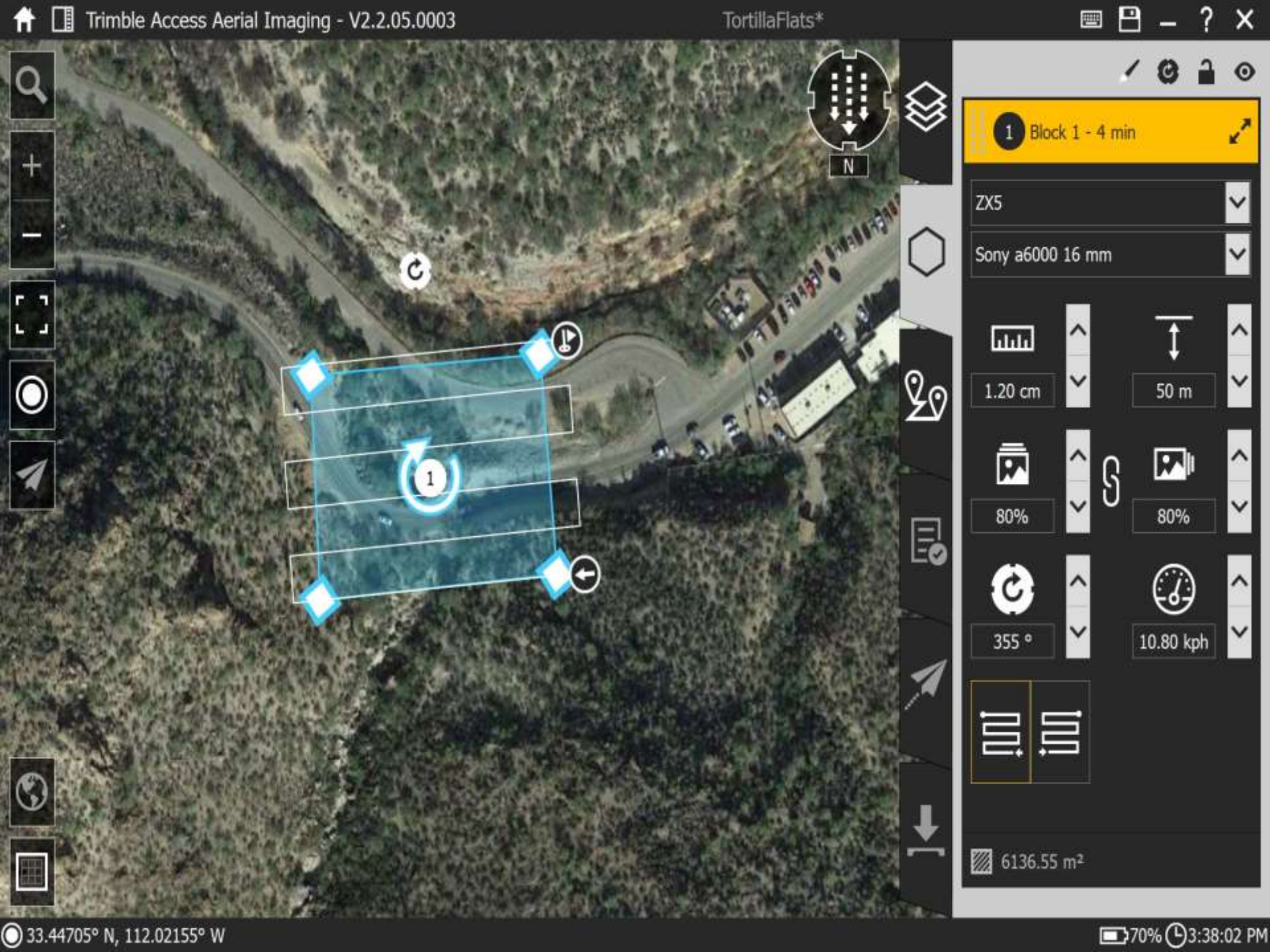
ESS UAV Support

- 2 operators FAA Part 107 certified
- Operators alternate flights to maintain proficiency
- If not flying, act as Visual Observer
- 253 flights – 33 hours total flight time

ESS UAV Support

- Maintenance checks conducted ~ 10 flights
- Pilot Log
  - Date, time, temp, cloud cover, wind, flying height, duration, etc.
- Flight Log
  - Date, time, location, purpose, operator, visual observer, etc.
- Battery charging cycles documented
  - Cell resistance and voltage recorded

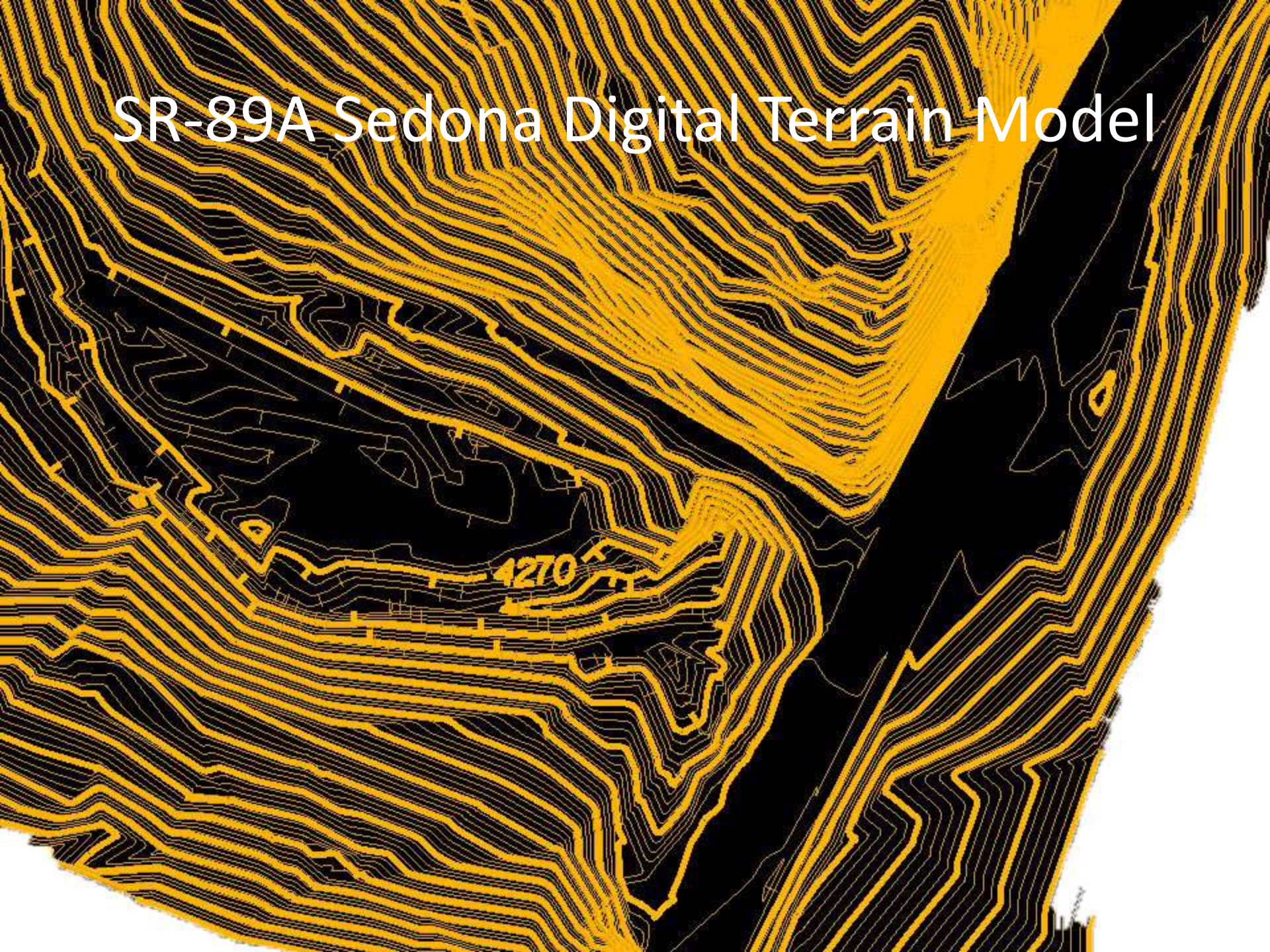

SR-88 Apache Trail Road Erosion


Trimble Access Aerial Imaging - V2.2.05.0003
TortillaFlats*
N
1
Block 1 - 4 min
ZX5
Sony a6000 16 mm
1.20 cm
50 m
80%
80%
355 °
10.80 kph
6136.55 m²
33.44705° N, 112.02155° W
70%
3:38:02 PM


US-60 Renaissance Fair

SR-89A Sedona Rockfall Mitigation

SR-89A Sedona Digital Terrain Model



HazMat Glass Pile

Picacho Pit Pre-Mine

Picacho Pit Post-Mine

Point Cloud (.las)

Ortho Image

Equipment

Equipment

- Trimble ZX-5 Multi-Rotor sUAS
  - 2 LiPo batteries capable of 20 minutes flight time
  - Weight ~ 11 lbs. with camera, gimbal, batteries
  - Speed ~ 6 mph
  - Jeti DC-16 remote controller
- Sony a6000 mirrorless camera
- 16 mm f2.8 aspherical ‘pancake’ lens (photogrammetry workflow)
- 16 – 50mm f3.5 – 5.6 lens (video & photos)

Additional Items

- Yaesu FTA-230 VHF Radio
  - Monitor air radio traffic
- Kestrel 2500 Pocket Weather Meter
  - Wind speed & Direction
  - Temperature
  - Barometric Pressure

CFR Part 107

- Both operators (RPIC's) are 107 certified
- Do not fly under a Certificate of Authorization (COA)
- Waiver applications for 107.39 (Operation Over Human Beings) denied
  - Forced us to find 'work-around'
  - Tested different flying heights vs camera footprint to find a solution to flying over moving vehicles

Thank you for submitting a 14 CFR Part 107 request for certificate of waiver through the automated FAA small unmanned aircraft (sUAS) waiver application portal.

When the FAA responds to a request for a certificate of waiver, it must follow the requirements of 14 CFR § 107.200, "Waiver policy and requirements," particularly those standards outlined in § 107.200(b). As stated in that section, the FAA uses the following criteria when making a decision as to whether to grant a waiver:

1) a complete description of the proposed operation; and
2) justification that establishes that the operation can safely be conducted under the terms of a certificate of waiver.

Given the criteria outlined above, the FAA is unable to approve your request for a waiver to §107.39 because you did not describe interventions, for one or more hazards, to mitigate risk to an acceptable level. Specifically:

• The FAA is unable to approve your request for a waiver to § 107.39 because the risk of injury to human beings was not adequately addressed. To operate over human beings, your application must show that if the proposed sUA collides with a person, the degree of injury has been evaluated through testing. The results of the testing (e.g., modeling data, drop tests, test data) must be included in the application. Helpful references to assist with a § 107.39 waiver submissions include:

- "The Micro Unmanned Aircraft Systems Aviation Rulemaking Committee (ARC) Recommendations Final Report." http://www.faa.gov/uas/resources/uas_regulations_policy/media/Micro-UAS-ARC-FINAL-Report.pdf; and

- Designation: F3178 Operational Risk Assessment of sUAS (fee charged). https://www.astm.org/. ASTM is an organization that produces standards for the industry, including operational risk assessments for sUAS.

If you would like to reapply, include as much detail as required to describe the proposed operation, the purpose of the operation, and method by which the proposed operation can be safely conducted. Information should identify potential hazards and risks of the waivered operation, including risk-mitigation strategies, and characteristics of the sUAS. Refer to the waiver safety explanation guidelines at: https://www.faa.gov/uas/request_waiver. You must address each of the guidelines for the applicable regulatory section to be waived. Address each guideline and how you propose to mitigate risks associated with the hazards utilizing operating limitations, technology, training, equipment, personnel, restricted access areas, etc. Only request a waiver from regulatory sections necessary to conduct the operation.

Sincerely,

JOSEPH V FAGAN JR

Digitally signed by JOSEPH V FAGAN JR
Date: 2018.04.22 04:57:39 -04'00'

General Aviation and Commercial Division, AFS-800

UAS Guidance Memo from State Engineer's Office

'ADOT employees operating agency owned UAS for the purposes of conducting Department business will do so in a manner that complies with all FAA regulations…employees are prohibited from using privately owned UAS for conducting Department business or on Department time.'

ADOT's Current Status

- ADUG – ADOT Drone User's Group
  - Bridge & Geotechnical Group
  - Communications Group
  - Engineering Survey Section

Questions?